

# LHC Commissioning

## Fermilab involvement in LARP

Elvin Harms & Mike Lamm/Fermilab  
on behalf of the Fermilab LARP collaboration



LHC Accelerator Research Program (LARP)



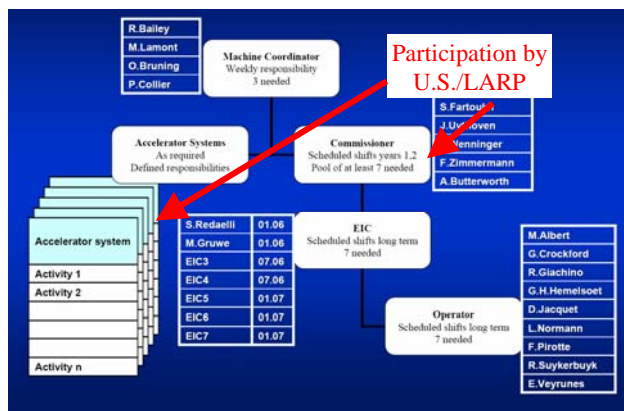
Fermilab is actively involved in LHC commissioning via the LARP collaboration and plays a lead role in LARP-based commissioning activities and planning.

### What is LARP?

The US LHC Accelerator Research Program enables U.S. accelerator specialists to take an active and important role in the LHC accelerator during its commissioning and operations, and to be a major collaborator in LHC performance upgrades. In particular, LARP will support U.S. institutions in LHC commissioning activities and accelerator science, accelerator instrumentation and diagnostics, and superconducting magnet R&D to help bring the LHC on and up to luminosity quickly, to help establish robust operation, and to improve and upgrade LHC performance. Furthermore, the work we do will be at the technological frontier and will thereby improve the capabilities of the U.S. accelerator community in accelerator science and technology to more effectively operate our domestic accelerators and to position the U.S. to be able to lead in the development of the next generation of high-energy colliders.

### Beam Commissioning

Fermilab/LARP is committed to being an active participant in LHC beam commissioning. CERN is creating a structure for commissioning. Fermilab's prime involvement will be through Accelerator systems support teams.



LHC Commissioning Organization

### Fermilab Involvement in Commissioning

Fermilab is currently actively involved in the following Commissioning activities:

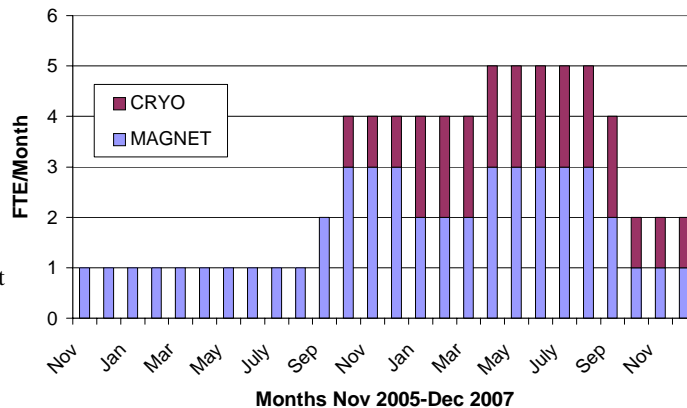
- Lead role in coordinating for and providing U.S. manpower for Hardware Commissioning
- Lead role in coordinating U.S. manpower for Beam Commissioning
- On-site presence at CERN in planning and learning the needs for beam commissioning. There was a nearly continuous presence at CERN by Fermilab staff over a 6-week span in Jan/Feb, 2006
- Sponsors of CERN operations personnel visiting Fermilab to gain experience with superconducting accelerators – 8 CERN Operations staff in past 12 months, 2 more later this year
- Review of CERN's commissioning organization and strategy
- Planning for a continuous presence at CERN during the SPS run through the end of CY06.

### Hardware Commissioning

Through LARP, Fermilab is taking an active role in the installation and hardware commissioning of the LHC accelerator:

- Installation oversight of accelerator components supplied to CERN LHC through the U. S. LHC accelerator Project
- Direct participation of hardware commissioner, primarily through Fermilab scientists and engineers living at CERN for one year. Commissioners come from the Accelerator and Technical Divisions with expertise in the areas of cryogenics, magnet operation, magnet quench protection and commissioning coordination. Initially the focus of this contribution was on the U. S. accelerator project deliverables, but has been expanded to include the hardware commissioning of the full accelerator.

### Fermilab-LHC Hardware Commissioning Profile



### Beam Commissioning Expressions of Interest

Interest in participation in Beam Commissioning is being actively solicited. To date there have nearly twenty responses to a direct request for expressing interest. An on-line response is available at <http://larp.fnal.gov/commissioningForm.html>



LHC Accelerator Research Program (LARP)

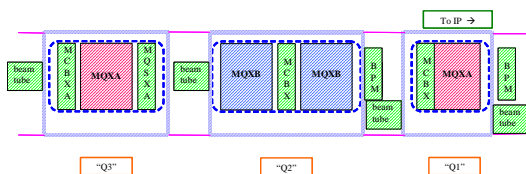


LHC Accelerator Research Program (LARP)



## Recent Hardware Commissioning and Installation Activity at CERN

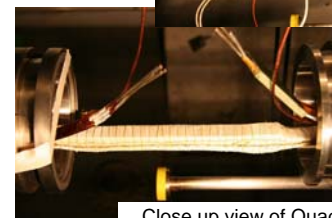
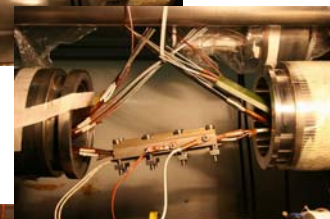
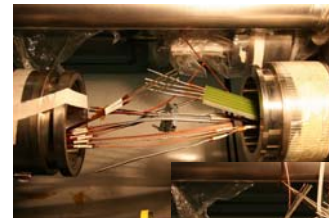
- Installation of U. S. Deliverables is well underway at Interaction Region 8 (LHC-B Experiment)



Schematic of CERN final focus elements. Q2 element contains Fermilab-built high gradient quadrupoles. Q1 and Q3 elements contain quadrupoles built by Toshiba/KEK. Corrector elements MCBX, MQSXA are supplied by CERN.



Technology Transfer to CERN Staff



Close up view of Quad bus work. Procedures, splice parts and splice tools provided by Fermilab



Successful installation of first US LHC Quads at LHC-B IP



Installation oversight of US feedbox

## LHC@FNAL

LHC@FNAL is a remote access center to be constructed on the atrium level of Wilson Hall and modeled on the new CERN Control Centre, CCC. Its functions are:

- A Place
  - That provides access to information in a manner that is similar to what is available in control rooms at CERN
  - Where members of the LHC community can participate remotely in CMS and LHC activities
- A Communications Conduit
  - Between CERN and members of the LHC community located in North America
- An Outreach tool
  - Where visitors will be able to see current LHC activities
  - Where visitors will be able to see how future international projects in particle physics can benefit from active participation in projects at remote locations.

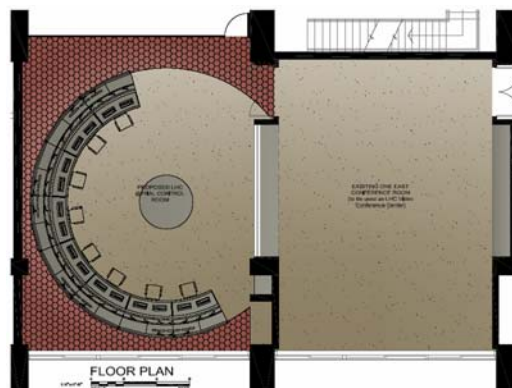
Funding has been secured and preparation for bids is in progress. Construction of LHC@FNAL is expected to be complete in September 2006.



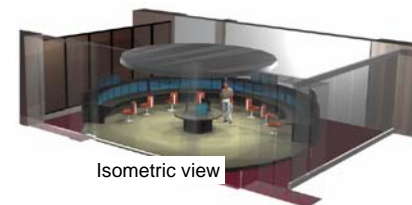
CERN CCC



View from Atrium



FLOOR PLAN



Isometric view



LHC @ FNAL  
OPERATIONS CENTER  
ATRIUM LEVEL PROPOSAL  
April 25, 2006  
FESS / Engineering